

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the above-identified application:

Listing of Claims

Claim 1 (Withdrawn): A complex functional apparatus comprising a haptic information element having haptic information portions corresponding to a plurality of different kinds of haptic information, each haptic information unit including: a first function unit configured to detect corresponding haptic information; and a second function unit configured to reproduce some or all pieces of detected haptic information.

Claim 2 (Withdrawn): The apparatus according to claim 1, wherein each haptic information unit has a plurality of electrode pairs, the first function unit obtains detection signals of the haptic information via the electrode pairs, and the second function unit reproduces some or all pieces of haptic information by converting the haptic information into physical quantities which are the same as or different from the detection signals by inputting electric power from an external power supply to the electrode pairs.

Claim 3 (Withdrawn): The apparatus according to claim 2, wherein the electrode pairs are formed via a metal oxide film, and the metal oxide film detects the detection signals.

Claim 4 (Withdrawn): The apparatus according to claim 3, wherein the metal oxide film is formed of a ferroelectric or pyroelectric.

Claim 5 (Withdrawn): The apparatus according to claim 1, wherein the plurality of different kinds of haptic information include a temperature and pressure.

Claim 6 (Withdrawn): The apparatus according to claim 5, wherein at least the haptic information unit which corresponds to a pressure as the haptic information is formed on a

cantilever-shaped elastic member.

Claim 7 (Withdrawn): The apparatus according to claim 5, wherein the haptic information unit which corresponds to a pressure as the haptic information detects a frequency and amplitude of a pressure acting on that portion, and is mechanically displaced at a frequency and amplitude according to the detection signal or pre-set pressure information by the external power supply.

Claim 8 (Withdrawn): The apparatus according to claim 5, wherein said haptic information element comprises a plurality of stacked structures each of which has an electrode, metal oxide film, and electrode structure formed on a cantilever-shaped elastic member.

Claim 9 (Withdrawn): The apparatus according to claim 5, wherein said haptic information element comprises a plurality of stacked structures each of which has an electrode, metal oxide film, and electrode structure formed on a cantilever-shaped elastic member, and another stacked structure arranged around the elastic member.

Claim 10 (Withdrawn): The apparatus according to claim 8, wherein the haptic information is detected based on an output from each stacked structure, and some or all detection signals are converted into physical quantities which are the same as or different from the detection signals by inputting electric power from the external power supply to that stacked structure so as to reproduce the haptic information.

Claim 11 (Withdrawn): The apparatus according to claim 8, wherein a plurality of cantilever-shaped elastic members are arranged in a rotation symmetry relationship.

Claim 12 (Withdrawn): The apparatus according to claim 1, wherein a plurality of haptic information elements equivalent to said haptic information element are linearly or two-dimensionally arranged.

Claim 13 (Withdrawn): A haptic information system comprising: a complex functional apparatus; an input controller configured to receive signals from respective haptic information elements; an arithmetic processor configured to store the signals and applying a signal process to the stored signals; and an output controller configured to read out the signals from said arithmetic processor and output the readout signals to said complex functional device, wherein said complex functional apparatus comprises haptic information elements each having haptic information units corresponding to a plurality of different kinds of haptic information, and each haptic information unit includes a first function unit configured to detect corresponding haptic information, and a second function unit configured to reproduce some or all pieces of detected haptic information.

Claim 14 (Withdrawn): The system according to claim 13, further comprising a communication circuit for exchanging the signals with an external apparatus.

Claim 15 (Withdrawn): A complex functional apparatus comprising a substrate, a metal oxide layer formed on said substrate, and an electrode, wherein said apparatus detects a plurality of different kinds of information by electrodes formed on a plurality of portions obtained by dividing said metal oxide layer.

Claim 16 (Withdrawn): The apparatus according to claim 15, wherein said metal oxide layer divided into the plurality of portions forms one element, and elements equivalent to that element are arranged linearly or two-dimensionally.

Claim 17 (Withdrawn): The apparatus according to claim 15, wherein said metal oxide layer comprises a ferroelectric or pyroelectric, and the information to be detected is one of a pressure, temperature, acceleration, and angular acceleration.

Claim 18 (Withdrawn): The apparatus according to claim 17, wherein said ferroelectric or pyroelectric is formed by alternately stacking crystal planes formed of a metal-oxygen, and crystal planes formed of oxygen alone, or alternately stacking crystal planes formed of a plurality of metals and oxygen.

Claim 19 (Withdrawn): The apparatus according to claim 15, wherein at least one portion of said metal oxide layer divided into the plurality of portions is formed on an elastic member attached to a hollow space structure.

Claim 20 (Withdrawn): The apparatus according to claim 19, wherein the portion that detects a temperature has the hollow space structure.

Claim 21 (Withdrawn): A complex functional apparatus comprising a detection device which comprises a substrate, a metal oxide layer formed on said substrate, and an electrode, detects a plurality of different kinds of information by electrodes arranged on a plurality of portions obtained by dividing said metal oxide film, and is stacked on a display configured to display video information.

Claim 22 (Withdrawn): The apparatus according to claim 21, wherein at least one portion of said metal oxide layer is formed on an elastic member attached to a hollow space structure.

Claim 23 (Withdrawn): The apparatus according to claim 22, wherein at least the portion that detects a pressure is attached to the elastic member attached to the hollow space structure.

Claim 24 (Withdrawn): The apparatus according to claim 21, wherein the electrodes of the portions that respectively detect a temperature and pressure are transparent electrodes.

Claim 25 (Withdrawn): A method of manufacturing a complex functional apparatus which detects a plurality of different kinds of information by electrodes formed on a plurality of portions obtained by dividing a metal oxide film, comprising: forming the metal oxide layer by independently supplying a metal source material and oxygen source material which form the metal oxide layer to a substrate.

Claim 26 (Withdrawn): The method according to claim 25, wherein a metal and oxygen which form the metal oxide layer are supplied from independent supply devices to alternately stack crystal planes formed of the metal and oxygen and crystal planes formed of the oxygen.

Claim 27 (Withdrawn): The method according to claim 26, wherein a metal component source material supplied from the independent supply device is a material selected from the group consisting of a metal, metal oxide, organometallic compound, and metal halide, and an oxygen source gas is a material selected from the group consisting of oxygen, ozone, and nitrogen oxide.

Claim 28 (Withdrawn): The method according to claim 27, wherein at least one of a heating device, an ionization device, a plasma conversion device, and an acceleration electrode for accelerating a charge substance is attached to the metal source gas supply device, and the source gas is supplied while being d composed and/or accelerated by the device attached.

Claim 29 (Withdrawn): The method according to claim 27, wherein at least one of a heating device, an ionization device, and a plasma generator is attached to the metal source gas supply device, and the source gas is supplied while being activated by the device attached.

Claim 30 (Currently Amended): An information input/output apparatus for controlling an operation of a target apparatus on the basis of a user authentication result associated with a user who operates the target apparatus, comprising:

an image display configured to visually display predetermined image information; and a menu presentation unit, which is arranged on the image display, configured to present a list of a plurality of menu items used to execute an operation of the target apparatus;

wherein the menu presentation unit has a plurality of units arranged in a matrix, each of the plurality of units including a haptic information acquisition unit configured to acquire haptic information of the user on the basis of a position of the menu item that the user touches with a finger of the plurality of menu items presented by said menu presentation unit and a haptic information output unit configured to output information perceivable by the user upon user's touching the haptic information output unit with the finger and arranged at the position of the plurality of menu items; and ;

a user authentication unit configured to authenticate the user on the basis of the haptic information acquired by said haptic information acquisition unit; and

~~a haptic information output unit configured to output information perceivable by the user upon user's touching the haptic information output unit with the finger and arranged at the position of the plurality of menu items.~~

Claim 31 (Canceled).

Claim 32 (Currently Amended): An information input/output apparatus for outputting predetermined haptic information to a user, and inputting a user's reaction made for the output haptic information, comprising:

an image display having a plurality of units arranged in a matrix wherein each of the plurality of units includes a haptic information output unit configured to output a plurality of

menu items required for the user to execute an operation of a target apparatus as haptic information in a state that allows the user to recognize information contents thereof upon user's touching the information with a finger and arranged at the position of the plurality of menu items; and a haptic information input unit configured to acquire a user's fingerprint on the basis of a position of the menu item touched by the user of the plurality of menu items output by said haptic information output unit; and

a user information processor configured to acquire a user's intention and authenticate the user on the basis of the user's fingerprint acquired by said haptic information input unit.

Claim 33 (Original): The apparatus according to claim 32, further comprising recognition result output unit configured to inform the user of at least one of information indicating whether or not the target apparatus has recognized the user's intention acquired by said user information processor, and authentication result information of the user by said user information processor in a state that allows the user to recognize contents of the information upon user's touching the information with the finger.

Claim 34 (Original): The apparatus according to claim 31, wherein the haptic information output by said haptic information output unit is information perceived by the user as at least one physical quantity of a three-dimensional pattern, electricity, and calorific value at respective positions of the plurality of menu items.

Claim 35 (Original): The apparatus according to claim 30, wherein the user is authenticated on the basis of fingerprint information of the user, which is detected from a distribution of at least one physical quantity of a pressure and calorific value produced by the finger of the user.

Claim 36 (Canceled):

Claim 37 (Canceled).

Claim 38 (Currently Amended): An information input/output method in an information input/output apparatus for outputting predetermined haptic information to a user, and inputting a user's reaction made for the output haptic information, comprising:

a haptic information output step of outputting a plurality of menu items required for the user on an image display to execute an operation of a target apparatus as haptic information at the position of the plurality of menu items in a state that allows the user to recognize information contents thereof upon user's touching the information with a finger;

a haptic information input step of acquiring a user's fingerprint on the basis of a position of the menu item on the image display touched by the user of the plurality of menu items output in the haptic information output step; and

a user information processing step of acquiring a user's intention and authenticating the user on the basis of the user's fingerprint acquired in the haptic information input step.

Claim 39 (Canceled).

Claim 40 (Currently Amended): A computer program for implementing an information input/output method in an information input/output apparatus for outputting predetermined haptic information to a user, and inputting a user's reaction made for the output haptic information, comprising:

a haptic information output step of outputting a plurality of menu items required for the user on an image display to execute an operation of a target apparatus as haptic information at the position of the plurality of menu items in a state that allows the user to recognize information contents thereof upon user's touching the information with a finger;

a haptic information input step of acquiring a user's fingerprint on the basis of a position of the menu item on the image display touched by the user of the plurality of menu items output in the haptic information output step; and

a user information processing step of acquiring a user's intention and authenticating the user on the basis of the user's fingerprint acquired in the haptic information input step.

Claim 41 (Canceled).

Claim 42 (Currently Amended): An information input/output apparatus for controlling an operation of a target apparatus on the basis of a user authentication result associated with a user who operates the target apparatus, comprising:

an image display configured to visually display predetermined image information; and
a menu presentation unit, which is arranged on the image display, configured to
present a list of a plurality of menu items used to execute an operation of the target apparatus;
wherein the menu presentation unit has a plurality of units arranged in a matrix, each
of the plurality of units including a haptic information acquisition unit configured to acquire
haptic information of the user on the basis of a position of the menu item that the user touches
with a finger of the plurality of menu items presented by said menu presentation means, said
haptic information acquisition unit comprising a haptic information element having haptic
information units corresponding to a plurality of different kinds of haptic information, and
each haptic information unit includes a first function unit configured to detect corresponding
haptic information, and a second function unit reproduce some or all pieces of detected haptic
information and a third function unit configured to output information perceivable by the user;
and

a user authentication unit configured to authenticate the user on the basis of the haptic information acquired by said haptic information acquisition unit;

~~wherein said haptic information acquisition unit comprises a haptic information~~
~~element having haptic information units corresponding to a plurality of different kinds of~~
~~haptic information, and each haptic information unit includes a first function unit configured~~

~~to detect corresponding haptic information, and a second function unit reproduce some or all pieces of detected haptic information and a third function unit configured to output information perceivable by the user.~~

Claim 43 (Currently Amended): An information input/output apparatus for controlling an operation of a target apparatus on the basis of a user authentication result associated with a user who operates the target apparatus, comprising:

an image display configured to visually display predetermined image information; and
a menu presentation unit, which is arranged on the image display, configured to present a list of a plurality of menu items used to execute an operation of the target apparatus;
wherein the menu presentation unit has a plurality of units arranged in a matrix, each of the plurality of units including:

a haptic information acquisition unit configured to acquire haptic information of the user on the basis of a position of the menu item that the user touches with a finger of the plurality of menu items presented by said menu presentation unit; and

a user authentication unit configured to authenticate the user on the basis of the haptic information acquired by said haptic information acquisition unit; and

a haptic information output unit configured to output information perceivable by the user upon user's touching the haptic information output unit with the finger and arranged at the position of the plurality of menu items,

wherein said haptic information acquisition unit comprises a substrate, a metal oxide layer formed on the substrate, and an electrode, and detects a plurality of different kinds of information by electrodes formed on a plurality of portions obtained by dividing the metal oxide layer.